Abstract.

We will discuss two types of deterministic numerical schemes to solve kinetic transport models associated to collisional theory or non-linear interactions given by the Boltzmann transport equation (BTE). This is an integro-differential transport equation that describes the evolution of a single point probability distribution function. The mathematical and computational difficulties associated to the Boltzmann equation are due to the non local - non linear nature of the integral operator accounting for their interactions and/or the coupling to the Poisson equation for charges accounting for long range interactions.

Two particular approaches to two different problems will be discussed. The first one is a Discontinuous Galerkin (DG) scheme applied to deterministic computations of the transients for the Boltzmann-Poisson system describing energy band electron transport in semiconductor devices, where the collisional term models optical-phonon interactions that become dominant under strong energetic conditions corresponding to nano-scale active regions under relative strong applied bias.

The second approach is based on a spectral methods with Lagrangian constrains to secure conservation applied to the non-linear Boltzmann equation for binary conservative or dissipative collisions.